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COMPLETE SPECIFICATION

A Centrifugal Clutch

I, Louis Marius Corne, of 56, Avenue Victor Hugo, Paris (Seine), France, a Citizen of the Republic of France, do hereby declare the nature of this invention and in what manner the same is to be performed, to be particularly described and ascertained in and by the following statement:—

This invention relates to centrifugal clutches comprising a plate, carrying clutch-engaging centrifugal masses, which plate for the purpose of engaging the main clutch can be clutched to the driving shaft by an auxiliary clutch which latter can be disengaged and the mass-carrying plate braked for disengaging the main clutch.

It has been previously proposed to provide a centrifugal clutch of the kind above referred to in which the auxiliary clutch comprises two electro-magnets one for clutching the mass carrying plate to the drive and the other for disengaging the mass-carrying plate from the drive and braking it.

The object of the present invention is to provide a centrifugal clutch of the kind first above referred to of simple construction and eliminating the need for brushes in the electrical connections.

With this object in view in a centrifugal clutch of the kind first above referred to made according to the invention, normally the auxiliary clutch of the mass-carrying plate is engaged by springs so as to clutch the said plate to a bell casing driven by the engine shaft, said plate being disconnected from the bell casing by energising a fixed electromagnet to attract an armature which rotates solidly with the plate, the electromagnet serving thus to disengage the auxiliary clutch and to brake its armature frictionally, whereby the mass-carrying plate is brought to rest and the main clutch is disengagd.

The invention also relates to various constructional arrangements such as the mounting of the mass-carrying plate inside a bell casing solid with the driving shaft; the centering of this plate on an extension of this casing; the centering of the movable presser plate of the main clutch, to which the thrust of the masses is imparted by a camplate whilst the movable presser plate co-operates with a counter plate, which is, moreover, subject to the thrust of the clutch springs in order to engage the main clutch disc; the mounting with some play of the counter plate and the clutch presser plate on connecting pins of the clutch casing and of the flywheel, in such a way that it may be considered as a floating mounting, the centering of the plates being effected automatically under the action of centrifugal force.

In the accompanying drawing, Fig. 1 is a section along the axis of a clutch made according to the invention and

Fig. 2 is an elevation of the mass-carrying plate.

On referring to the drawing it will be seen that the engine flywheel bolted on the driving shaft is denoted 1; this flywheel rotates solidly with a bell casing 2 being attached thereto by bolts, not shown. Inside the bell casing 2 is disposed a plate 4, on which are pivotally mounted at 5 the masses 6, the function of which will be hereafter explained.

The plate 4 comprises a portion forming a hub 4^1 in which is bolted (by means not illustrated in the drawing) a tubular hub 7 surrounding the driven shaft 8 and splined to engage with the hub of an armature 27, which forms the driven disc of the auxiliary clutch and brake.

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In the hub of the plate 4 are provided grooves or seatings 32, in which are disposed coil springs 33 bearing at one end against the bottom of the grooves 32 and at the other end against the heads 34 of bolts 35, the screw threaded ends of which are screwed into the armature 27. This armature can engage with the friction facing 30 carried by the shoulder 2^3 of the bell, which facing is made of a material having a good co-efficient of friction, this arrangement constituting the auxiliary clutch.

The mass-carrying plate 4 is mounted by means of a double action ball bearing 36 in the bell 2. This bearing journals and at the same time takes the end thrust of the plate 4 in the bell 2. The mass-carrying plate 4 in practice comprises a hub having four double arms 37, the masses 6 being mounted between these double arms around spindles 5. On these spindles 5 are mounted mass-return springs 38 formed by steel wires of which one of the arms is fixed in the hub of the plate 4, whilst the other arm is directed upwards and presses back the heel of the masses 6. Transverse pins 39 carried by the masses bear, under the action of centrifugal force in the outward extreme position, when the mass-carrying plate turns, against the arms 37 of the mass-carrying plate, thus limiting outward movement of the masses 6. When the mass carrying plate slows down, the springs 38 act on the heels of the masses and tend to restore them to the rest position.

Rollers 11 of the masses 6 act against a cam plate 14 which, through the intermediary of a ball race 40 mounted in a conical cage 41, exerts a thrust on the movable counter plate 15.

The bearing 40, 41 serves at the same time as a thrust-bearing and centering device. The plate 14, is, moreover, driven in rotation by the mass-carrying plate 4 through the intermediary of splines 42 which are constructed in such a way as to permit of relative longitudinal movement of these two plates and to participate in their relative centering.

When the masses move outwards under the action of centrifugal force, the rollers 11 press back the cam 14. The latter can move longitudinally and exert a thrust against a suitably shaped part of a movable counter plate 15.

The counter plate 15 is centered on the assembly comprising the bell 2 and the flywheel 1 by means of the pins 3, passing through apertures in an extension 15¹ of the plate 15.

The presser plate 21 of the main clutch 20 is slidingly mounted on the pins 3; this presser plate 21 is adapted to clamp the driven disc 20 of the main clutch frictionally against the flywheel 1 for engaging the main clutch. Springs 22 are mounted between the presser plate 21 and the counter plate 15 to cushion engagement. Suitable screws 16 fixed on the counter plate 15, the heads of which are engaged in suitable seats on the presser plate 21, limit the relative axial movement of these two plates and permit of imparting to the springs 22 a suitable initial compression.

It should be observed that the counter plate 15 and the presser plate 21, connected by the screws 16 and the springs 22, are both slidably mounted with a substantial play on the same pins 3; they may be said to be floatingly mounted inside the bell and their centering is ensured by centrifugal force.

This arrangement avoids jamming when the two plates execute movements of translation.

The main clutch driven disc 20, the hub of which slides on splines on the driven shaft 8, is mounted between the clutch presser plate 21 and the flywheel 1. Springs 3^2 or other suitable devices such as hydraulic or pneumatic damping devices and the like, may be provided in particular to brake movement of the plate 21 towards the flywheel 1 and thus ensure progressive, engagement of the clutch, and, in addition to disengage the main clutch when the thrust of the masses 6 ceases.

An electro-magnet 28 carried by a fixed part 29 and comprising an annular friction facing 31 having a good co-efficient of friction, attracts the armature 27 of the auxiliary clutch when it is energised.

The apparatus operates in the following manner:

When the electromagnet is not energised, the armature 27 of the auxiliary clutch pressed frictionally against the facing 30 through the bolts 35, by the springs 33, causes the mass-carrying plate 4 to rotate solidly with the bell 2, and in consequence with the engine flywheel 1. When the plate turns at low speed, the masses 6 do not come into action and the mass carrying plate 4 turns without engaging the clutch.

When the speed exceeds a given value, the masses move centrifugally outwards and, through the intermediary of the rollers 11, displace the cam plate 14 acting through the thrust bearing 40 on the counter plate 15, which slides on the pins 3. The springs 22 tighten and transmit the movement of the counter plate 15 to the main clutch presser plate 21, which clamps the main

clutch driven disc 20 against the motor flywheel 1, thereby engaging the main clutch, that is to say the engine flywheel 1 and the driven shaft 8 are caused to rotate solidly. In order to disengage the main clutch it is sufficient to energise the electromagnet 28, to disengage the auxiliary clutch by attracting its armature 27 away from the facing 30, and pressing it against the facing 31 which brakes it strongly, at the same time as the spring 33 are compressed by the sliding of the bolts 35 connected to the armature 27.

The mass-carrying plate 4 being thus immobilised, the masses 6 return inwardly to their rest position and the plate 14, on which the rollers 11 no longer act, is brought back by the springs 3^1 and 22 which move the main clutch presser-plate 21 away from the flywheel 1 thus releasing the driven clutch disc 20.

It will be seen immediately that this centrifugal clutch is conditioned for automatic engagement and disengagement under speed control by the springs 33 maintaining the auxiliary clutch engaged, whilst the release of the main clutch at any speed is effected by electromagnetic means which disengage the auxilary clutch and frictionally brake the mass-carrying plate.

The relative arrangements of the cam plate, of the ball races, of the movable counter plate, of the clutch springs and of the main clutch presser-plate, produce a straight line transmission of the thrust of the masses in the working position to the median line of the friction facing of the main clutch disc, which is particularly favourable for the full use and even wearing of the friction surfaces.

It should be observed that the braking of the armature 27 of the electromagnet 28 is effected not by metal against metal, but by metal against a facing 31 of friction material suitably selected for this purpose.

Finally, the construction of the parts has been studied in order to simplify the construction; thus the masses are made in such a way as to require in the way of accurate machining only the drilling in a metallic mass of the three apertures adapted to receive the pin 5, the roller spindle 11^1 and the stop 39.

The clutch can be used for coupling a variable speed engine with an apparatus driven by it and more particularly as a clutch on automobile vehicles, thereby simplifying the driving of such apparatus by eliminating the clutch pedal, the electromagnet control for disengaging the clutch being effected automatically through the intermediary of one of the other control devices of the vehicle.

Having now particularly described and ascertained the nature of my said invention and in what manner the same is to be performed, I declare that what I claim is:—

1. A centrifugal clutch comprising a plate, carrying clutch-engaging centrifugal masses, which plate for the purpose of engaging the main clutch can be clutched to the driving shaft by an auxiliary clutch which, latter can be disengaged and the mass carrying plate braked for disengaging the main clutch, characterised by the feature that normally the auxiliary clutch of the mass-carrying plate is engaged by springs so as to clutch the said plate to a bell casing driven by the engine shaft, said plate being disconnected from the bell casing by energising a fixed electromagnet to attract an armature which rotates solidly with the plate, the electromagnet serving thus to disengage the auxiliary clutch and to brake its armature frictionally, whereby the mass-carrying plate is brought to rest and the main clutch is disengaged.

2. A centrifugal clutch according to Claim 1, wherein the mass-carrying plate is disposed inside the bell casing which is solid with the engine flywheel, the hub of said plate being mounted in the hub of the bell by means of a double action ball bearing which centers and supports end thrust of the plate in the bell at the same time.

3. A centrifugal clutch according to Claim 1 or 2 wherein the centrifugal masses act on a sliding cam plate actuating a counter plate which actuates the movable clutch presser plate.

4. A centrifugal clutch according to Claim 3 wherein the cam plate is made to rotate solidly with the mass-carrying plate by means of splines.

5. A centrifugal clutch according to Claim 3 or 4 wherein springs are interposed between the counter plate and the movable clutch presser plate, said springs being initially compressed by means of screws fixed in the counter plate, the heads of which can engage in seatings in the movable plate.

6. A centrifugal clutch according to any one of Claims 3—5 wherein the counter plate and the movable plate are mounted with play on pins connecting the bell with the engine flywheel in such a way that centering of these parts is effected under the action of centrifugal force.

7. A centrifugal clutch according to any one of Claims 1—6, wherein the armature of the fixed electromagnet is

slidingly mounted on the hub of the mass-carrying plate, whilst at the same time rotating solidly with the latter, the armature being braked by energising the electromagnet to press it frictionally against a suitable friction facing carried by the electromagnet.

8. A centrifugal clutch according to any one of Claims 1—7 wherein recesses are provided in the hub of the mass-carrying plate, in which recesses are disposed, the auxiliary clutch springs acting on the heads of rods solid with the armature, in order to press the armature against a facing on the bell, in such a way as to clutch the mass-carrying plate frictionally to the bell.

9. A centrifugal clutch according to any one of Claims 3—8 wherein a ball race mounted in a conical cage and acting both as a thrust bearing and centering device is disposed between the cam plate and the movable counter plate.

10. A centrifugal clutch according to any one of Claims 1—9 wherein the mass-carrying plate is fitted with double arms, in which are mounted the supporting pins for the masses, springs being mounted around said pins, said springs comprising steel wires tending to restore the masses to their rest position as soon as the centrifugal force drops below a given against a suitable friction facing carried value.

11. A centrifugal clutch according to any of Claims 1—10 wherein the masses each comprise a metallic mass requiring no precision machining apart from drilling three apertures to receive respectively a pivot pin, a roller spindle and a stop.

12. A centrifugal clutch constructed, arranged and adapted to operate substantially as described with reference to and as illustrated in the accompanying drawings.

Dated this 21st day of November, 1947.

For the Applicant,
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[This Drawing is a reproduction of the Original on a reduced scale.]

Fig-1

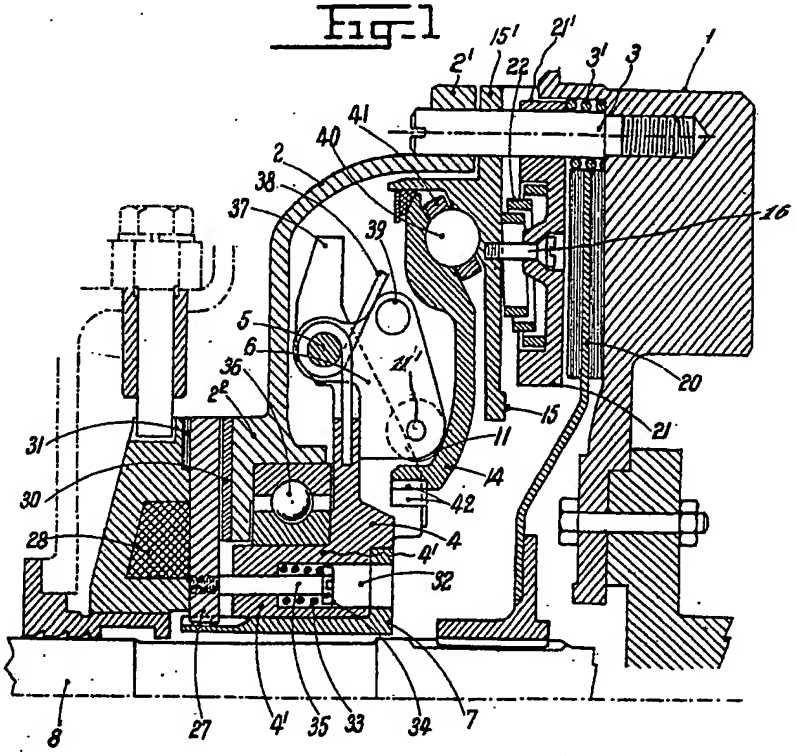
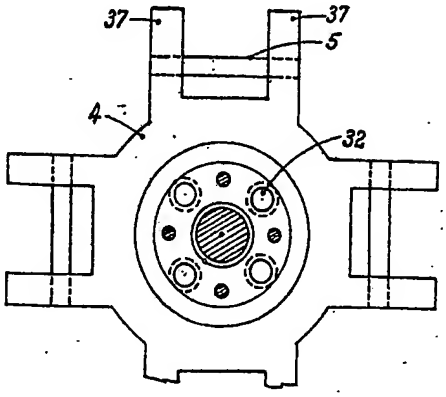


Fig-2



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